Because there are two different rules for $g(x)$ in different "pieces" of the domain, g is called a **piecewise function** of x.

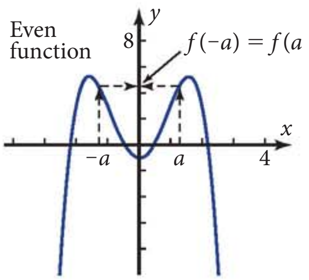
PROPERTY: Absolute Value Transformations

The transformation $g(x) = \left|f(x)\right|$
- Reflects f across the x-axis if $f(x)$ is negative
- Leaves f unchanged if $f(x)$ is nonnegative

The transformation $g(x) = f(\left|x\right|)$
- Leaves f unchanged for nonnegative values of x
- Reflects the part of the graph for positive values of x to the corresponding negative values of x
- Eliminates the part of f for negative values of x

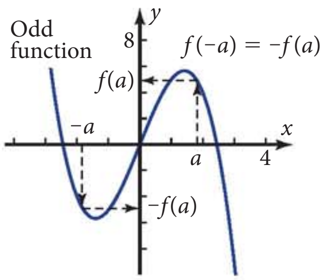
Even Functions and Odd Functions

Figure 1-6e shows the graph of $f(x) = -x^4 + 5x^2 - 1$, a polynomial function with only even exponents. (The number 1 equals $1x^0$, which has an even exponent.) Figure 1-6f shows the graph of $f(x) = -x^3 + 6x$, a polynomial function with only odd exponents. What symmetries do you observe?



$f(x) = -x^4 + 5x^2 - 1$

Figure 1-6e



$f(x) = -x^3 + 6x$

Figure 1-6f

Reflecting the graph of the even function $f(x) = -x^4 + 5x^2 - 1$ horizontally across the y-axis leaves the graph unchanged. You can see this algebraically given the property of powers with even exponents.

$f(-x) = -(-x)^4 + 5(-x)^2 - 1$ Substitute $-x$ for x.

$f(-x) = -x^4 + 5x^2 - 1$ Negative number raised to an even power.

$f(-x) = f(x)$

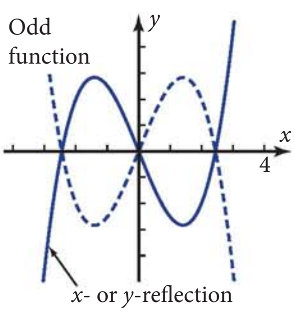


Figure 1-6g

Figure 1-6g shows that reflecting the graph of the odd function $f(x) = -x^3 + 6x$ horizontally across the y-axis has the same effect as reflecting it vertically across the x-axis. Algebraically,

$f(-x) = -(-x)^3 + 6(-x)$ Substitute $-x$ for x.

$f(-x) = x^3 - 6x$ Negative number raised to an odd power.

$f(-x) = -f(x)$